80188 MP3 Jukebox

Functional Specification

Tim Menninger

Table of Contents

[Description 3](#_Toc440718558)

[Global Variables 3](#_Toc440718559)

[Inputs 3](#_Toc440718560)

[Buttons 3](#_Toc440718561)

[Power 4](#_Toc440718562)

[Playback 4](#_Toc440718563)

[Outputs 4](#_Toc440718564)

[Display 4](#_Toc440718565)

[Audio 4](#_Toc440718566)

[User Interface 4](#_Toc440718567)

[Buttons 4](#_Toc440718568)

[Dials 6](#_Toc440718569)

[Display 6](#_Toc440718570)

[Memory 6](#_Toc440718571)

[Error Handling 6](#_Toc440718572)

[Algorithms 6](#_Toc440718573)

[Data Structures 6](#_Toc440718574)

[Limitations 7](#_Toc440718575)

[Known Bugs 7](#_Toc440718576)

[Special Notes 7](#_Toc440718577)

# Description

This is the MP3 Jukebox running on an 80188 processor. It plays MP3 files that are stored on an SD memory card or IDE hard drive. Its basic functions include:

* Skip to Next Track
* Skip to Previous Track
* Play
* Pause
* Stop
* Repeat Song
* Repeat Playlist
* Fast Forward
* Reverse
* Scan
* Volume

Each of these will be connected to a button except for volume, which will be controlled by a rotary switch. These are described in the *user interface* section.

Songs stored on this device will be able to range from one second to as long as memory permits. These songs will be played using an onboard MP3 decoder chip. When playing back, the MP3 Jukebox will require speakers or headphones be plugged in for music to be heard. The system will be fully functional otherwise when being used with no audio output connected.

For ease of use, the MP3 Jukebox will include an LCD status display which will display the status of the system. When the user presses a button, the screen will display a summary of what in the system has changed, if anything, and when music is playing, the screen will display the song name, artist, album if applicable and the time in the song that is being played.

# Global Variables

None.

# Inputs

## Buttons

Each function listed in *Description* and described in *User Interface* will have a button or rotary encoder. Some functions are overloaded onto the same button.

* **Button 1** Play, Pause
* **Button 2** Previous Track, Rewind
* **Button 3** Next Track, Fast Forward
* **Button 4** Stop
* **Button 5** Repeat Song, Repeat Playlist, Repeat Segment
* **Button 6** Scan
* **Rotary Switch 1** Volume
* **Rotary Switch 2** Miscellaneous

For debugging purposes, there will be a trap button, which will allow the programmer to trap the system. This button will stop the processor from reading and executing code.

* **Button 7** Trap

## Power

There will be a power switch on the machine. When switched on, the machine will draw power and have the capability to play. When switched off, this capability will not exist even if a power supply is provided. There will also be an input for power supply. With no power, the MP3 Jukebox cannot play audio files.

* **Switch 1** Power Switch
* **Port 1**  Power Supply

## Playback

In addition to these switches, there will also be an SD Card input from which songs are read and played and an audio port to plug in speakers, headphones, etc. for playback of said songs.

* **SD Card Input**  Songs read from SD Card
* **IDE Hard Drive** Songs can also be read from an IDE hard drive
* **Port 2**  Audio Output

# Outputs

## Display

There will be an LCD display on board that displays the status of the system. This display will be four lines. Exactly what appears on this display is described in detail in *User Interface*.

## Audio

There will be a port that plays the music that is read from memory. Headphones, speakers, etc. can be plugged in for playback.

# User Interface

## Buttons

There is one button for both playing and pausing the song. If the state of the system is such that a file is being played, then pressing this button will pause the song. In any other state (paused, stopped) such that there is power being supplied, pressing this button will play the current song on the playlist.

There is one button for both skipping to the previous track and rewinding. When pressed, the track is not skipped until release of the button. At the release of the button, the system will skip to the beginning of the current song unless the song is in its first three seconds of playing. In this case, it will skip to the beginning of the previous song on the playlist. If the button is held for more than two seconds, then the system begins to rewind from the current place in memory until the user releases the button. The speed of rewind is 2x for the first 10 seconds of rewind (twelve seconds after initial button press) and then 4x from there after. If the beginning of the current song is reached during rewind, it will begin rewinding from the end of the previous song.

Similar to the previous/rewind button, there is one button for skipping forward and fast forwarding. Without loss of generality, this works exactly the same as rewinding except in the opposite direction. The only exception is the forward skip function always skips to the beginning of the next song on the playlist regardless of location of playback in the current song.

The stop button, when pressed, will stop play and lose the spot of the current playback. To begin playing again, the play button must be pressed and play will begin at the beginning of the playlist.

There will be a toggle option for repeating music. There can be repeat off, repeat song and repeat playlist. On repeat off, the music will stop playing at the end of the playlist. This would be equivalent to pressing stop at the end of the last song. On repeat song, the song currently playing will be repeated. This would be equivalent to pressing the previous skip every time the current song ends. Finally, there will be a repeat playlist which will begin playing from the beginning of the playlist after the end of the last song in the playlist. Finally, there will be repeat segment. When repeat segment is turned on, the location of music is remembered as point A. The user can then use the miscellaneous rotary dial to choose an offset (in time) to point B. Pressing the repeat button again will cause the system to repeat the segment from point A to point B, skipping to point A whenever point B is reached. If the time offset is 0 on the second press of the repeat button (i.e. the rotary switch was not touched), the repeat option will continue to toggle repeat options. Turning off this feature after choosing points A and B can be done by pressing the repeat button again or the scan button. The default value for this is repeat off.

The scan button will be a toggle button. When on, it will play the first [integer] seconds of each song. The integer used here can be altered by the miscellaneous rotary dial and can range from 1 to 15 seconds. At the end of those seconds, it will skip to the next song. To stop scanning, the user presses the scan button again to toggle off. This feature will respect the repeat option—if there is no repeat and scan reaches the end of the playlist, music will stop. If there is repeat song, this will continuously play the first five seconds of the same song. The default value for this is scan off and scan time 5 seconds.

The trap button will allow the user/programmer to trap into the kernel and should be used for debugging purposes only. Pressing the trap button during operation will cause the music player to stop playing.

## Dials

The volume rotary dial will control the volume of the output. This particular dial will be one that can rotate forever without reaching some bound. Rotating it counterclockwise will turn the volume down and rotating it clockwise will turn the volume up.

The miscellaneous rotary dial will be used for certain options. It will allow the user to scroll display options while the song is playing. If the user desires to repeat a segment, this dial will control the length of time that is recorded. Finally, when in scan mode, this dial will control how much time each song plays before scanning to the next song.

## Display

When a song is playing, the display will show the song title on the first line, the artist on the second line, the album on the third line and the time in the song on the fourth line. Additionally, on the fourth line on the left side will be an icon for the state of the music player. This could be the right-facing triangle for play, the double-bar pause button or double-triangles for skipping, fast forwarding and rewinding.

If the user scrolls, the bottom line of the display will change. Other display options include the repeat status (off, song, playlist, segment) of the song and a line that shows the progress into the song. When the music is stopped, nothing will be written on the display.

## Memory

Songs will be read from an IDE hard drive by default. If there is an SD chip in the SD slot, then music will be read from there.

# Error Handling

None.

# Algorithms

None.

# Data Structures

None.

# Limitations

This MP3 player currently does not play music.

# Known Bugs

None.

# Special Notes

None.